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6-3-1969

## Test 1015: John Deere 4520 Syncro Range

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# NEBRASKA TRACTOR TEST 1015 – JOHN DEERE 4520 SYNCRO RANGE DIESEL

## POWER TAKE-OFF PERFORMANCE

Hp	Crank- shaft speed rpm	Fuel Consumption		Temperature Degrees F				Barometer inches of Mercury
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb	
*								
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours								
123.39	2200	7.942	0.445	15.54	190	69	78	28.700
Standard Power Take-off Speed (1000 rpm)—One Hour								
115.22	1905	7.179	0.431	16.05	196	70	79	28.700
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS								
109.14	2286	7.333	0.464	14.88	198	71	86	.....
0.00	2390	2.370	.....	.....	176	71	87	.....
55.94	2342	4.784	0.591	11.69	181	71	88	.....
123.70	2200	7.988	0.446	15.49	206	71	88	.....
28.34	2362	3.621	0.883	7.83	179	71	88	.....
82.63	2312	6.087	0.509	13.57	189	73	90	.....
Av	66.63	2315	5.364	0.556	12.42	188	71	88
								28.820

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption		Temp Degrees F			Barometer inches of Mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling med	Air wet bulb	Air dry bulb

### VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST

<b>Maximum Available Power—Two Hours—4th Gear</b>											
111.21	8219	5.07	2196	6.82	8.177	0.508	13.60	182	60	71	29.040
<b>75% of Pull at Maximum Power—Ten Hours—4th Gear</b>											
89.84	6223	5.41	2293	4.88	7.024	0.540	12.79	186	68	77	28.665
<b>50% of Pull at Maximum Power—Two Hours—4th Gear</b>											
58.89	3925	5.63	2348	3.44	5.520	0.648	10.67	176	55	59	29.040

### MAXIMUM POWER WITH BALLAST

99.20	13221	2.81	2253	14.56	2nd Gear	.....	195	74	89	28.620
111.30	10831	3.85	2200	9.28	3rd Gear	.....	203	74	91	28.620
112.85	8294	5.10	2201	6.66	4th Gear	.....	201	79	95	28.610
112.74	6544	6.46	2201	5.02	5th Gear	.....	199	78	96	28.610
110.55	4834	8.58	2199	3.73	6th Gear	.....	193	78	96	28.610
107.45	3599	11.20	2201	2.82	7th Gear	.....	196	74	97	28.610

### MAXIMUM PULL WITHOUT BALLAST

97.14	9693	3.76	2278	14.59	3rd Gear	.....	180	51	57	28.700
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### VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds Pull	8294	8458	8705	8773	8152	7734
Horsepower	112.85	103.34	91.67	82.92	66.85	52.54
Crankshaft speed rpm	2201	1981	1713	1538	1326	1096
Miles per hour	5.10	4.58	3.95	3.54	3.08	2.55
Slip of drivers, %	6.66	6.82	7.13	7.28	6.51	6.20

### TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 20.8-38; 10; 20	Two 20.8-38; 10; 14
	—Liquid	1426 lb each	None
	—Cast iron	527 lb each	None
Front tires	—No, size, ply & psi	Two 10.00-16; 6; 28	Two 10.00-16; 6; 28
	—Liquid	None	None
	—Cast iron	23 lb each	None
Height of drawbar		23 inches	23½ inches
Static weight with operator—Rear		13675 lb	9770 lb
	Front	4175 lb	4130 lb
	Total	17850 lb	13900 lb

Department of Agricultural Engineering

Date of Test: June 3 to June 10, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

**FUEL, OIL and TIME** Fuel No 2 Diesel Cetane No 52.2 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8299 Weight per gallon 6.910 lb Oil SAE 30 API service classification MS-DS To motor 3.361 gal Drained from motor 2.931 gal Transmission and final-drive lubricant John Deere special 303 oil Total time engine was operated 47 hours.

**ENGINE** Make John Deere diesel Type 6 cylinder vertical with turbo-charger Serial No M25R0235979R Crankshaft mounted lengthwise Rated rpm 2200 Bore and stroke 4¼ x 4¾" Compression ratio 15.7 to 1 Displacement 404 cu in Cranking system 12 volt electric (two 6 volt batteries) Lubrication pressure Air cleaner pre-cleaner and 2 dry type in parallel with replaceable treated paper elements Oil filter full flow replaceable paper cartridge Oil cooler engine coolant heat exchanger for crankcase oil and radiator for transmission and hydraulic system Fuel filter sediment bowl and screen and replaceable paper primary and secondary filter elements Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type standard Serial No T813-R006693R Tread width rear 70" to 100" front 56" to 84.8" Wheel base 105.5" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 33.86" Vertical distance above roadway 39.97" Horizontal distance from center of rear wheel tread 0.12" to the left Hydraulic control system direct engine drive Transmission selective gear fixed ratio with partial range syncro-mesh Advertised speeds mph first 1.95 second 3.13 third 4.13 fourth 5.31 fifth 6.61 sixth 8.66 seventh 11.21 eighth 18.30 reverse 4.02 and 6.43 Clutch single plate dry disc operated by foot pedal Brakes wet disc hydraulically power actuated by two foot pedals that can be locked together Steering hydrostatic power Turning radius (on concrete surface with brake applied) right 151" left 151" (on concrete surface without brake) right 171" left 171" Turning space diameter (on concrete surface with brake applied) right 302" left 302" (on concrete surface without brake) right 342" left 342" Power take-off 998 rpm at 1900 engine rpm.

**REPAIRS and ADJUSTMENTS:** No repairs or adjustments.

**REMARKS:** All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First gear was not run as it was necessary to limit the pull in second gear to avoid excessive wheel slippage. Eighth gear was not run because it exceeded 15 mph.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1015.

L. F. LARSEN  
Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman  
W. E. SPLINTER  
D. E. LANE  
Board of Tractor Test Engineers

# EXPLANATION OF TEST REPORT

## GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

## PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

## BELT OR POWER TAKE-OFF PERFORMANCE

**Maximum Power and Fuel Consumption.** The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

**Varying Power and Fuel Consumption.** Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque,  $\frac{1}{2}$  of the 85% torque; maximum power,  $\frac{1}{4}$  and  $\frac{3}{4}$  of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

## DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

**Varying Power and Fuel Consumption With Ballast.** The varying power runs are made to show the effect of

speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

**Maximum Power with Ballast.** Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

**Maximum Pull without Ballast.** All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

**Varying Power and Travel Speed with Ballast.** Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



JOHN DEERE 4520 SYNCRO RANGE DIESEL